

A STUDY OF SELECTED KANSAS HIGH SCHOOL SCIENCE CLUBS

by

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## INTRODUCTION

In 1921, Science Service, a nation wide program concerned with supplementing American science education, was started. The concern of this program was to initiate, stimulate, and foster science clubs in schools throughout the United States. Since the initiation of this early program, more than twenty-five thousand organizations in the United States, its possessions and in foreign countries have become affiliated with Science Clubs of America as an activity of Science Service. Thus, it is seen that over the years increased attention has been given to the importance and improvement of science clubs in the educational program of the public schools of the United States. In this regard, Smith and Anderson write:

There can be little doubt that the extensive scholarship programs, science club movements, science camps, and other similar programs have been established in hope of providing more attractive incentive for students to enter the study of science.<sup>1</sup>

The many pursuits provided by science clubs can engage the leisure-time interest of students and also serve as an important motivating influence in spurring such students to meet the highly demanding scholarship requirements of today's educational program. Support of this position has been given by Dr. Watson Davis who describes the role of the science club in science education as follows:

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<sup>1</sup> Herbert A. Smith and Kenneth E. Anderson, Encyclopedia of Educational Research, third edition; New York: The Macmillan Company, 1960, p. 1217.



What grass roots are to agriculture, science clubs are to science education. These bands of boys and girls are a perpetual youth movement, constantly renewed by the innate and undulled curiosity and exploratory spirit of those who are discovering, through doing, the world about them.

If the future belongs to youth and to science, then there is a vastly more important place for science clubs in the scheme of things that are to be.<sup>2</sup>

Dr. Davis comments further on the role of the science club in the educational program:

With so much depending upon the development of every brain of our nation's science talent, everything should be done that can be done to bring to fruition the scientific ability that exists throughout the breadth of our land.<sup>3</sup>

Because of the multiplicity of science clubs and other similar co-curricular activities, Harry C. McKown has termed this era as the "age of clubs."<sup>4</sup> McKown goes on to give a basic definition of school clubs that is applicable to a science club:

Basically, a club is merely a more or less organized group of individuals with the same interest, and this interest may concern any phase of life and its activities. The furtherance of this interest naturally becomes, in most instances, the main objective -- stated or implied -- of this group. Consequently, the club becomes a real instrument of education for its members and, at the same time, automatically tends to advance the interest represented.<sup>5</sup>

In order for a club to function properly as an educational tool it must be founded upon sound basic principles. In this regard a list of such basic

<sup>2</sup> Watson Davis, "Science Clubs of America--An Educational Force for the Future," Education, March, 1945, 65(7):406.

<sup>3</sup> Ibid., p. 407.

<sup>4</sup> Harry C. McKown, Extracurricular Activities, New York: The Macmillan Company, 1956, p. 152.

<sup>5</sup> Ibid., p. 152.

principles as presented by Thompson,<sup>6</sup> Gruber and Beatty,<sup>7</sup> and McKoown<sup>8</sup> who are authorities on school clubs was compiled and is presented below:

1. A club should capitalize on gregariousness.
2. A club should widen and deepen student interests.
3. A club should motivate and enrich classroom work.
4. A club should develop worthy social ideals, attitudes, and habits.
5. A club should be based on definite and worthy objectives.
6. The purposes and activities of the club should be those of its student members.
7. Wherever possible, club activities should grow out of curricular activities.
8. The club program should fit the local situation.
9. Provisions should be made for the proper encouragement and limitation of participation.
10. Every student should belong to a club.
11. Club membership should be voluntary.
12. All students should have equal opportunities for joining clubs.
13. The club should be limited in size.
14. The club should not be considered vocational in purpose.
15. Normally, the club meetings should be scheduled on regular school time.
16. Club meetings should be held on school premises.
17. Club sponsors should be carefully chosen and assigned.
18. Generally speaking, there should be no outside sponsorship.

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<sup>6</sup> Nellie Z. Thompson, Your School Clubs, New York: E. P. Dutton & Co., Inc., 1956, pp. 15-17.

<sup>7</sup> Frederick C. Gruber and Thomas Bayard Beatty, Secondary School Activities, 1954, New York: McGraw-Hill Book Co., Inc., p. 30.

<sup>8</sup> McKown, op. cit., pp. 152-161.

### Purpose of the Study

The purpose of this study was to ascertain certain practices of selected Kansas high school science clubs. The following questions were considered in the development of the study:

1. What are the criteria of a good science club program as suggested in literature relative to science clubs in high schools.
2. What activities are best suited for employing this criteria.
3. How frequently do selected Kansas high schools use these activities.
4. What is the relative effectiveness of these activities in meeting the objectives of science instruction in Kansas high schools.

### Procedure

The procedures employed in conducting this study were as follows:

1. An intensive investigation of the pertinent literature contained in the Kansas State University library and additional materials prepared by Science Clubs of America was conducted.
2. A questionnaire<sup>9</sup> based on science club practices relative to the frequency of use of certain activities, opinions as to the effectiveness of these activities, and selected practices related to the organizational aspects was mailed to 61 selected Kansas high schools on the basis of enrollment as listed for school year 1961-1962.<sup>10</sup> Kansas public high schools with enrollments of 400

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<sup>9</sup> A copy of the questionnaire and the accompanying letter can be found in Appendix A.

<sup>10</sup> A list of school systems cooperating in this study is contained in Appendix B.



or more were included in this study. The reason for the lower limit of enrollment as a means of selecting schools for the study was based on the assumption that schools with larger enrollments tend to offer more co-curricular activities. Thus, more science clubs would be included in the study. Replies were received from 44 or 72.1 percent of the schools contacted.

### An Analysis of Selected Literature Pertinent to High School Science Clubs

The growth and development of science clubs in the American high school has been paralleled by increasing efforts to give youth more scientific opportunities than are provided in classroom instruction. In the early years of science clubs, students often sponsored and maintained their scientific interests as individuals or groups and thus supplemented their science education. In this regard, Dr. Davis wrote that the activities of the above mentioned groups aided in the development of Pioneer America:

Except that it is now given purpose, aid and encouragement through tools and programs, this ganging-up of those who want to find out about nature, machines and stuff is not a very new phenomenon.

Boys have had their workshops in barn and basement. In Pioneer American days the whole struggle for existence was one big experiment and the children played their early and practical parts in it.<sup>11</sup>

Educational thought and investigation of the early twentieth century had been focusing the attention of teachers, educators, supervisors, and the public upon certain educative forces that existed quite apart from the

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<sup>11</sup> Davis, op. cit., p. 406.



activities of the classroom. From these considerations, co-curricular activities, and consequently science clubs, were viewed in a light of greater importance.

Meister, in 1921, conducted a survey of the educational value of certain after-school activities in science. This early study revealed considerable evidence to support the belief that science clubs compare most favorably with curriculum work in science in terms of educational outcomes.<sup>12</sup>

In addition, a number of articles concerned with some basic considerations of science clubs were contained in the professional journals. For example, one article by Meister reveals basic considerations with respect to the management of a science club:

It may be said that managing a successful Science Club depends upon four factors:

1. A club that is general in its interest and appeal rather than special.
2. A workable set of materials, which to a great extent can now be supplied by the toys the boys themselves possess.
3. A definite program of activities along the lines here described:
  - a. Lectures
  - b. Trips
  - c. School assemblies, exhibitions, bazaars, etc.
  - d. A work period
  - e. A demonstration program
4. Intelligent leadership; the chief element of which is an ability to set the stage so that the boys will themselves carry out the program.<sup>13</sup>

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<sup>12</sup> Morris Meister, "The Educational Value of Certain After-school Activities in Science," Doctor's Dissertation, Teachers College, Columbia University, 1921.

<sup>13</sup> Morris Meister, "Managing a Science Club," School Science and Mathematics, March 1923, 23(3):205-217.

The chief role of the science club according to Meister is as follows:

The chief role of the Science Club should be as a vehicle on which to carry promiscuous after-school activities into the school-room; where we may guide and control without losing that free, vital, purposeful urge to thought and to action that is so common to things our pupils do outside the classroom and often so sadly lacking in the things they do for us during school hours. And it may be that lessons taught us while running a club may reveal to us the secret of a classroom procedure that will make for greater efficiency.<sup>14</sup>

Support of Meister's position with respect to the role of the science club is given by Hunter who describes what a science club can do for a school:

Meister and others, in recent articles, have shown the advantages to boys and girls of high school age of membership in a science club. That these values are numerous and worthwhile no one would deny.

But there is another side to the science club situation which should be spoken of and that is the relation of a science club to the school.....I clearly perceive that a science club can have a very large part in the organization not only of science work but in esprit de corps, in demonstration work and in real service to the school community.<sup>15</sup>

By 1928, changes were evidenced in some science clubs in that the clubs started initiation ceremonies for new members. One such club was the Edisonian Science Club of Chicago, Illinois.<sup>16</sup> Other changes taking place in this early period of science clubs include using speakers from state academies and the distribution of science literature to science clubs.

Concerning the above mentioned early developments in science clubs Astell wrote:

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<sup>14</sup> Ibid., p. 217.

<sup>15</sup> George H. Hunter, "What a Science Club can do for a School," School Science and Mathematics, December 1923, 23:817.

<sup>16</sup> Louis Astell, "Initiation Ceremony of the Edisonian Science Club," School Science and Mathematics, October 1928, 28:771-774.



There is a great variety of possibilities for science clubs everywhere. These clubs are worth developing from many points of view, but the chief consideration is that of developing leadership in the student and an increased interest and appreciation for the spirit and methods of science on the part of the students and the community.

We must develop these clubs because the need for this scientific attitude is increasing rather than decreasing, and because the club offers certain dynamic opportunities for the development of clear vision and sane attitudes toward the problems of today, all of which means progress generally as well as scientifically.<sup>17</sup>

Prior to World War II, Science Service, an institution for the popularization of science, was planning the basic structure of the National Science Youth Program. Science Clubs of America was to be a major constituent of this program.

It was at a point in America's prewar state that Science Service was determined that there should be a widespread effort in inspiring the growth and development of science clubs. Rising partly out of exhibits shown by the American Institute of the City of New York at the New York World's Fair, there were some science clubs initiated. With the possibility of these efforts being abandoned, Science Service made a decisive step in the development of science clubs as the following quotation shows:

When, in 1941, Science Service learned that this effort might have to be abandoned, it was determined that the institution that had pioneered in putting science in the newspapers should turn some of its efforts toward science for youth. With the existing group of some 700 science clubs as a basis, Science Clubs of America was instituted.<sup>18</sup>

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<sup>17</sup> Astell, "Fostering Science Clubs in the High School," Journal of Chemical Education, March 1929, 6:500.

<sup>18</sup> Science Clubs of America, "Growth of the Science Youth Program," Washington: Science Service, 1959, p. 2.



After World War II, there was a realization of the need of scientists and engineers in America. The value of science clubs in fulfilling these needs became evident. Dr. Watson Davis describes this new realization and the importance of science clubs in aiding to meet the urgent need of scientists and engineers:

America finished the war with a realization that there were not nearly enough scientists and development engineers available to discover new basic knowledge, do the necessary industrial and military research and train the oncoming scientific program.

Many science club members in the schools of the nation this fall are receiving their first contact with science and its possibilities. The extent to which they and their teachers develop science club opportunities will determine to a large degree how well the urgent need for scientists will be answered.<sup>19</sup>

In 1947, in recognition of the progress in science and science education since 1932, the National Society for the Study of Education devoted Part I of its yearbook to science education in American schools. In this publication, the values of science clubs are comprehensively described:

In the first place, the work of the club is reflected in improved work of the class. A science-club member becomes an interested and interesting class member. A science club provides experiences from which the class can develop important concepts and generalizations. Working for the club brings about better co-operation among pupils and between teacher and pupils. It improves demonstrations and stimulates laboratory work. It sometimes helps to solve annoying discipline problems. It gives the teacher a standing and dignity in the community that resounds in dozens of ways to the credit of the school and of the teacher.<sup>20</sup>

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<sup>19</sup> Watson Davis, "Youth Learns Science," Science News Letter, 52:218-219, October, 1947.

<sup>20</sup> Science Education in American Schools (Forty-sixth Yearbook of the National Society for the Study of Education, Nelson B. Henry, Editor, Chicago: The National Society for the Study of Education, 1947, Part I, p. 230.

During the early 1950's, science clubs were being defined and established with precise objectives. Donald Geiser, for example, defines a science club as follows:

Any group of pupils organized to pursue in an interesting, exciting, and orderly manner a definite program of scientific appreciation, investigation, and experimentation, under able and enthusiastic leadership and guidance.<sup>21</sup>

Richard Weigel gives support of the above mentioned definition with the following statement:

A group of students organized to pursue in an interesting and orderly manner, under proper leadership and guidance, a definite program of scientific investigation.<sup>22</sup>

The objectives of a science club have been presented by Donald Geiser as follows:

Since the main objective of the curricular science course is to give the student an understanding of scientific principles, materials and procedures, the most important purpose of the club members in the different fields of science. Several ways in which this all-important objective may be realized are: (1) through educational and vocational guidance; (2) by providing training in self expression; (3) by closer contacts between teacher and pupils; (4) by providing opportunities to perform complicated and difficult experiments; and (5) by fostering the learning and practice of applications of science.

In a few words, a science club in the high school should stimulate and guide the pupil's growth in understanding materials, forces, and elements. Through these understandings his behavior should be changed.<sup>23</sup>

In addition, attention has been directed to the objectives of science club by Weigel who listed the following objectives as a starting point for high school science clubs:

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<sup>21</sup> Donald Geiser, "The Importance of High School Science Clubs," School Activities, March 1954, 25:217.

<sup>22</sup> Richard Weigel, "Organizing the Science Club," School Activities, January 1951, 22:157.

<sup>23</sup> Geiser, op. cit., p. 218.



1. The acquisition of supplementary and factual information.
2. Information on modern applications of current science.
3. The development of scientific appreciations and attitudes.
4. Experimentation.
5. Development of projects.
6. School and community benefits through science assemblies.
7. Sponsorship of school museums.
8. The correlation of intra- and extra-curricular activities.
9. Field trips.
10. Stimulation of pupil research.
11. Training in the use of the inductive method.
12. Development of individual student interest.
13. Provision for social intercourse.
14. Development of student leadership.
15. Learning self-expression.
16. Development of self-reliance.
17. Worthy use of leisure time.
18. Building character via search for truth.
19. Development of good citizenship.
20. Provide for guidance and vocational training.<sup>24</sup>

Through the years, there has been a steady growth in the numbers of science clubs in American high schools both at home and abroad. In addition, there has been an increase in the number of science clubs in the high schools of foreign countries. Today, the number of such clubs affiliated with the National organization, Science Clubs of America, has

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<sup>24</sup> Richard Weigel, "Organizing the Science Club," School Activities, January 1951, 22:157-158.



grown to more than twenty-five thousand with approximately five hundred of these science clubs being overseas.

#### THE FREQUENCY OF USE OF CERTAIN SCIENCE CLUB ACTIVITIES

In order to obtain information supplementary to that found in the review of pertinent literature, a questionnaire concerning certain science club practices was sent to the science club sponsors of 61 Kansas high schools having enrollments of 400 or more students. It was expected that the questionnaire would show a pattern of the frequency of use of certain activities, opinions as to the effectiveness of these activities, and of selected practices related to the organizational aspects of selected Kansas high school science clubs.

Replies to the questionnaire were received from 44 or 72.1 percent of the schools contacted. Eight or 18.2 percent of the schools replying indicated that they did not have a functioning science club.

#### Most Frequently Used Science Club Activities

A summary of the cooperating science club sponsors' responses relative to the activities most frequently employed in their science clubs is shown in Table 1. Data contained in Table 1 show that it was the regular practice of 12 or 33.3 percent of the cooperating schools to employ the activity of keeping up with current science news, while 15 or 41.6 percent of the cooperating schools reported that it was often their practice to keep up with current science news. Thus, 74.9 percent of the schools reporting used this activity regularly or often while considerably smaller percentages were reported to the activity being

used "at times," "seldom," or "never." The percentages ranging from 13.9 to 5.6 respectively.

Table 1 also reveals that it was the regular practice of 11 or 30.6 percent of the cooperating schools to employ the activity of getting acquainted with the facilities for science in the community, while 14 or 38.8 percent of the cooperating schools reported that it was often their practice to employ this activity. Therefore, 69.4 percent of the reporting schools employed this activity either regularly or often while smaller percentages were reported to the activity being used "at times," or "seldom." The percentages being 25.0 and 5.6 percent respectively.

Data presented in Table 1 also show that 7 or 19.4 percent of the cooperating schools reported that they regularly employed the activity of preparing and constructing individual projects; while a considerably larger percentage (41.7 percent) reported that the activity was often used. Additional frequencies concerning the activity of preparing and constructing individual projects were, "at times," 8 or 22.2 percent, "seldom," 5 or 13.9 percent, and "never," 1 or 2.8 percent.

It may also be seen in Table 1 that it was the practice of 12 or 33.3 percent of the cooperating schools to regularly employ the activity of having talks, presentations, or demonstrations by outside speakers, while 9 or 25.0 percent reported that it was often their practice to employ this activity. Hence, 58.3 percent of the responding schools used this activity either regularly or often while a smaller percentage

Table 1. Summary of Questionnaire responses received from 36 selected Kansas high school science clubs relative to the most frequently used of certain activities.

Activities	Frequency of Use											
	Regularly			Often			At times			Seldom		
	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Total Num- ber
6. Keep up with current science news	12	33.3	15	41.6		5	13.9		2	5.6		36
8. Acquaint yourself with facilities for science in your community	11	30.6	14	38.8		9	25.0		2	5.6		36
10. Preparation and construction of individual projects	7	19.4	15	41.7		8	22.2		5	13.9		36
9. Have talks, presentations, or demonstrations by outside speakers	12	33.3	9	25.0		6	16.6		5	13.9		36
12. Keeping occupational and educational information in science posted for members of your club and other interested	13	36.1	5	13.9		8	22.2		6	16.6		36
												99.9



indicated frequencies of "at times," "seldom," or "never." The percentage ranging from 16.6 to 11.1 respectively.

Keeping occupational and educational information in science posted for members and others interested was reported as being the regular practice of 13 or 36.1 percent of the cooperating schools, while 5 or 13.9 percent of the cooperating schools reported that it was often their practice to employ this activity. Thus, 50 percent of the schools reporting used this activity either regularly or often. Additional frequencies of mention concerning the activity of keeping occupational and educational science information posted for members and others interested in such matters were, "at times," 8 or 22.2 percent, "seldom," 6 or 16.6 percent, and "never," 4 or 11.1 percent.

#### Least Used Science Club Activities

A summary of the cooperating science club sponsors' reactions relative to the activities that were used the least by their science clubs is shown in Table 2. Data contained in Table 2 reveals that 4 or 11.1 percent of the cooperating schools reported that it was their practice to seldom employ the activity of exchanging scientific items with clubs in other states and countries, while 27 or 75.0 percent of the cooperating schools reported that it was their practice to never employ this activity. Thus, 86.1 percent of the schools reporting indicated that they seldom or never used this activity and no school reported that it was their practice to exchange scientific items with clubs in other states and countries regularly. However, the practice was reported "often," or "at times" in a small number of cases. The percentages being 2.8 and 11.1 percent respectively.

Table 2. Summary of Questionnaire responses received from 36 selected Kansas high school science clubs relative to the least used of certain activities.

Activities	Frequency of Use											
	Regularly			Often			At times			Seldom		
	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Total Num- ber
11. Exchange sci- entific items with clubs in other states and countries	0	0	1	2.8	4	11.1	4	11.1	27	75.0	36	100
14. Participate in science con- gresses	1	2.8	1	2.8	4	11.1	5	13.9	25	69.4	36	100
15. Keeping a science museum	1	2.8	0	0	5	13.9	4	11.1	26	72.2	36	100
5. Prepare and pre- sent assembly programs	1	2.8	2	5.6	4	11.1	6	16.6	23	63.9	36	100
3. Study science biographies	1	2.8	4	11.1	7	19.4	7	19.4	17	47.2	36	99.9
13. Construction of new or needed laboratory equipment	3	8.3	3	8.3	6	16.6	9	25.0	15	41.7	36	99.9
4. Participate in National Science Talent Search	3	8.3	3	8.3	11	30.6	4	11.1	15	41.7	36	100

Table 2 also reveals that 5 or 13.9 percent of the cooperating schools indicated that it was their practice to seldom participate in science congresses, while 25 or 69.4 percent of the cooperating schools reported that it was their practice to never participate in science congresses. Hence, 83.3 percent of the responding schools seldom or never employed this activity, while considerably smaller percentages were reported to the activity being used "regularly," "often," or "at times." The percentages ranging from 2.8 to 11.1 respectively.

Data contained in Table 2 show that in 4 or 11.1 percent of the cooperating schools, it was their practice to seldom keep a science museum, while 26 or 72.2 percent of the cooperating schools reported that it was their practice to never keep a science museum. Therefore, 83.3 percent of the schools reporting either seldom or never used this activity while considerably smaller percentage (2.8 percent) reported the activity being used "regularly." No school reported the activity being employed "often" or "at times."

It may also be seen in Table 2 that the preparation and presentation of assembly programs was reported as being seldom practiced by 6 or 16.6 percent of the cooperating schools, while 23 or 69.3 percent of the cooperating schools reported that it was their practice to never employ this activity. Additional frequencies concerning the activity of preparing and presenting assembly programs as reported by the cooperating schools were, "at times," 4 or 11.1 percent, "often," 2 or 5.6 percent, and "regularly," 1 or 2.8 percent.

Table 2 also reveals that 7 or 19.4 percent of the cooperating schools reported that it was their practice to seldom employ the activity of studying science biographies, while 17 or 47.2 percent of the cooperating schools



indicated that it was their practice to never use this activity. Thus, 66.6 percent of the responding schools either seldom or never used this activity. However, a small percentage of the cooperating schools reported that the activity was used "regularly," or "often." The percentages being 2.3 and 11.1 percent respectively.

Data contained in Table 2 reveals that 9 or 25.0 percent of the cooperating schools indicated that it was their practice to seldom construct new or needed laboratory equipment, while 15 or 41.6 percent of the cooperating schools reported that they employed this activity. Therefore, 66.6 percent of the schools reporting indicated that they seldom or never employed this activity. Additional frequencies concerning the activity of constructing new or needed laboratory equipment as reported by the cooperating schools were, "at times," 6 or 16.6 percent, "often," 3 or 8.3 percent, and "regularly," 3 or 8.3 percent.

The National Science Talent Search is an annual activity of Science Clubs of America in cooperation with the Westinghouse Educational Foundation. Scholarships and awards are given to the participating high school science students throughout the country. The data presented in Table 2 reveal that 4 or 11.1 percent of the cooperating schools reported that it was their practice to seldom participate in the National Science Talent Search, while a larger percentage, 41.6 percent, reported that the activity was never used. Thus, 19 or 52.7 percent of the schools reported that this activity was seldom or never employed. Additional frequencies concerning the activity of participating in the National Science Talent Search as reported by the cooperating schools were, "at times," 11 or 30.6 percent, "often," 3 or 8.3 percent, and "regularly," 3 or 8.3 percent.

The Frequency of Participation in Science Fairs,  
Field Trips, and Science Achievement Awards

A summary of the cooperating science club sponsors' responses relative to the frequency of participation in science fairs, field trips, and science achievement awards is presented in Table 3. Data contained in Table 3 reveal that it was the practice of 16 or 44.6 percent of the cooperating schools to participate occasionally in science fairs. Additional frequencies concerning participation in this activity were, "regularly," 10 or 27.8 percent, "often," 1 or 2.8 percent, "seldom," 3 or 8.3 percent, and "never," 6 or 16.6 percent.

Table 3 also reveals that it was the occasional practice of 13 or 36.1 percent of the cooperating schools to conduct field trips. Other frequencies concerning the practice of conducting field trips as reported by the cooperating schools were "regularly," 4 or 11.1 percent, "often," 4 or 11.1 percent, "seldom," 12 or 33.3 percent, and "never," 3 or 8.3 percent.

It may also be seen in Table 3 that frequencies concerning the practice of participating in science achievement awards for students, as reported by the cooperating schools, were "regularly," 8 or 22.2 percent, "often," 4 or 11.1 percent, "at times," 9 or 25.0 percent, "seldom," 5 or 13.9 percent, and "never," 10 or 27.8 percent.

Additional Activities Used in Selected  
Kansas High School Science Clubs

This section of the study presents cooperating science club sponsors' responses to the last question asked in section I of the questionnaire: "List other activities that your club uses."

Table 3. Summary of Questionnaire responses received from 36 selected Kansas high school science clubs relative to the frequency of participation in science fairs, field trips, and science achievement awards.

Activities	Frequency of Use											
	Regularly			Often			At times			Seldom		
	Num- ber	Per- cent	: Num- ber	Per- cent	: Num- ber	Per- cent	: Num- ber	Per- cent	: Num- ber	Per- cent	: Num- ber	Per- cent
1. Participate in science fairs	10	27.8	1	2.8	16	44.5	3	8.3	6	16.6	36	100
2. Conduct field trips	4	11.1	4	11.1	13	36.1	12	33.3	3	8.3	36	99.9
7. Participate in science achievement awards for students	8	22.2	4	11.1	9	25.0	5	13.9	10	27.8	36	100



Listed below are the other science club activities as reported, one each, by the four science club sponsors who responded to the above mentioned request:

1. Presentation of programs to civic groups.
2. Conduction of science seminar for club members.
3. Student prepared science club programs.
4. Participation in the Kansas Junior Academy of Science.

#### OPINIONS AS TO THE EFFECTIVENESS OF CERTAIN SCIENCE CLUB ACTIVITIES

This section of the study presents cooperating science club sponsors' reactions to section II of the questionnaire. The section was designed to ascertain the opinions of the cooperating sponsors as to the effectiveness of certain science club activities in meeting the objectives of science instruction in secondary schools. The procedure employed to ascertain such opinions was a five item rating scale ranging from "extremely effective" to "no effectiveness." The instrument may be seen in Appendix A.

#### Developing Scientific Appreciations

A summary of the cooperating science club sponsors' responses relative to opinions as to the effectiveness of certain activities in developing scientific appreciations is shown in Table 4. Data presented in Table 4 show that a variety of opinions existed in regard to the degree of effectiveness of science club activities in developing scientific appreciations. However, it may be seen from Table 4 that 15 or 53.5 percent of the cooperating science club sponsors rated the following items as being "extremely effective" in developing scientific appreciations:

Table 4. Summary of Questionnaire responses received from selected Kansas high school science clubs relative to opinion as to the effectiveness of certain science club activities in developing scientific appreciation.

Activities	Degree of Effectiveness*											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
17. Participate in science fairs	13	44.9	10	34.4	4	13.8	1	3.4	1	3.4	29	99.9
18. Conduct field trips	15	53.5	6	21.4	5	17.8	1	3.6	1	3.6	28	99.9
19. Study science biographies	7	25.9	8	29.6	6	22.2	2	7.4	4	14.8	27	99.9
20. Participate in the National Science Talent Search	7	25.0	5	17.9	9	32.1	2	7.1	5	17.9	28	100
21. Prepare and present assembly programs	10	35.7	6	21.4	4	14.3	0	0	8	28.6	28	100
22. Keep up with current scientific news	15	53.5	11	39.2	0	0	1	3.6	1	3.6	28	99.9

Table 4. (cont'd.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
23. Participate in science achievement awards for students	10	35.7	8	28.6	1	3.6	3	10.7	6	21.4	28	100
24. Acquaint yourself with facilities for science in your community	15	53.5	7	25.0	5	17.9	1	3.6	0	0	28	100
25. Have talks, presentations, or demonstrations by outside speakers	15	53.5	12	42.6	1	3.6	0	0	0	0	28	100
26. Preparation and construction of individual projects	12	42.9	11	39.3	2	7.1	0	0	3	10.7	28	100



Table 4. (concl.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent		Num- ber	Per- cent		Num- ber	Per- cent		Num- ber	Per- cent	Total
27. Exchange scientific items with clubs in other states and countries	4	14.3		7	25.0		6	21.4		3	10.7	28
												100
28. Keep occupational and educational information in science posted for members of your club and others interested	8	28.6		8	28.6		8	28.6		1	3.6	28
												100
29. Construction of new or needed laboratory equipment	4	14.3		9	32.1		7	25.0		0	0	28
												100
30. Keep a science museum	6	21.4		9	32.1		2	7.1		1	3.6	28
												100

\* A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.

1. Conducting field trips.
2. Keeping up with current science news
3. Getting acquainted with facilities for science in the community.
4. Having talks, presentations, or demonstrations by outside speakers.

It may also be of interest to note from Table 4 that it was the opinion of only 4 or 14.3 percent of the cooperating schools that the construction of new or needed laboratory equipment was extremely effective in developing scientific appreciations.

It may also be seen in Table 4 that an equally small number, 4 or 14.3 percent of the 28 cooperating schools indicated that the exchange of scientific items with science clubs in other states and countries was extremely effective in developing scientific appreciations.

#### Developing Instrumental Skills

Table 5 contains a summary of the cooperating science club sponsors' responses relative to opinions as to the effectiveness of certain activities in developing instrumental skills. Data presented in Table 5 show that a variety of opinions existed in regard to the degree of effectiveness of certain science club activities in developing instrumental skills. However, it may be seen from Table 5 that 11 or 47.8 percent of the cooperating schools indicated that, in their opinion, preparing and constructing individual projects was extremely effective in developing instrumental skills. Additional frequencies concerning participation in this activity as reported by the cooperating schools were "considerably effective," 8 or 34.8 percent, "averagely effective," 1 or 4.3 percent, and "no effectiveness," 3 or 13.0 percent. No schools reported the activity as being "slightly effective."

Table 5. Summary of Questionnaire responses received from selected Kansas high school science clubs relative to opinions as to the effectiveness of certain science club activities in developing instrumental skills.

Activities	Degree of Effectiveness *											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
17. Participate in science fairs	4	14.3	8	28.6	10	35.7	3	10.7	3	10.7	28	100
18. Conduct field trips	4	15.3	4	15.3	6	23.1	6	23.1	6	23.1	26	99.9
19. Study science biographies	3	12.5	1	4.2	4	16.6	3	12.5	13	54.1	24	99.9
20. Participate in the National Science Talent Search	4	16.0	2	8.0	7	28.0	4	16.0	8	32.0	25	100
21. Prepare and present assembly programs	1	4.0	8	32.0	7	28.0	2	8.0	7	28.0	25	100
22. Keep up with current science news	4	16.0	5	20.0	5	20.0	4	16.0	7	28.0	25	100



Table 5. (cont'd.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	: ber	Num- ber	Per- cent	: ber	Num- ber	Per- cent	: ber	Num- ber	Per- cent	: ber
23. Participate in science achievement awards for students	5	20.8		5	20.8		1	4.2		6	25.0	
										7	29.2	
												24
												100
24. Acquaint yourself with facilities for science in your community	3	12.0		7	28.0		8	32.0		3	12.0	
										4	16.0	
												25
												100
25. Have talks, presentations, or demonstrations by outside speakers	4	16.0		5	20.0		9	36.0		3	12.0	
										4	16.0	
												25
												100
26. Preparation and construction of individual projects	11	47.8		8	34.8		1	4.3		0	0	
										3	13.0	
												23
												99.9
27. Exchange scientific items with clubs in other states and countries	4	17.4		3	13.0		6	26.1		3	13.0	
										7	30.4	
												23
												99.9

Table 5 (concl.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
28. Keep occupa- tional and educational information in science posted for members of your club and others interested	4	16.6	2	8.3	9	37.5	1	4.2	8	33.3	24	99.9
29. Construction of new or needed labor- atory equip- ment	8	34.8	8	34.8	1	4.3	0	0	6	26.1	23	100
30. Keep a science museum	4	16.6	2	8.3	6	25.0	5	12.5	9	37.5	24	99.9

\* A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.

It may also be of interest to note from Table 5 that it was the opinion of only 1 or 4.0 percent of the cooperating schools that the preparation and presentation of assembly programs was extremely effective in developing instrumental skills. Additional percentages reported for the activity of preparing and presenting assembly programs were "considerably effective," 8 or 32.0 percent, "averagely effective," 7 or 28.0 percent, "slightly effective," 2 or 8.0 percent, and "no effectiveness," 7 or 28.0 percent.

#### Developing Problem Solving Skills

A summary of the cooperating science club sponsors' reactions relative to opinions as to the effectiveness of certain activities in developing problem solving skills is shown in Table 6. The data presented in Table 6 reveal that it was the opinion of 13 or 50.0 percent of the cooperating schools that preparing and constructing individual projects was an extremely effective activity in developing problem solving skills.

Table 6 also reveals that only 1 or 4.2 percent of the 24 cooperating schools responding to the activity of preparing and presenting assembly programs indicated that this activity was extremely effective in developing problem solving skills.

It may also be seen in Table 6 that only 1 or 4.8 percent of the 21 cooperating schools indicated that the activity of keeping a science museum was extremely effective in developing problem solving skills.

#### Providing Functional Understanding of Scientific Principles

Table 7 contains a summary of the cooperating science club sponsors' responses relative to the effectiveness of certain activities in providing a



Table 6. Summary of Questionnaire responses received from selected Kansas high school science clubs relative to opinions as to the effectiveness of certain science club activities in developing problem solving skills.

Activities	Degree of Effectiveness*											
	A			B			C			D		
	Num- : ber	Per- cent	Num- : ber	Per- cent	Num- : ber	Per- cent	Num- : ber	Per- cent	Num- : ber	Per- cent	Num- : ber	Per- cent
17. Participate in science fairs	9	32.1	6	21.4	9	32.1	2	7.1	2	7.1	28	99.8
18. Conduct field trips	3	11.5	3	11.5	7	26.9	7	26.9	6	23.1	26	99.9
19. Study science biographies	3	12.0	0	0	5	20.0	5	20.0	12	48.0	25	100
20. Participate in The National Science Talent Search	5	21.7	5	21.7	6	26.1	0	0	7	30.4	23	99.9
21. Prepare and present assembly programs	1	4.2	5	20.8	8	33.3	5	20.8	5	20.8	24	99.9
22. Keep up with current science news	4	16.6	4	16.6	4	16.6	8	33.3	4	16.6	24	99.7
23. Participate in science achievement awards for students	3	12.5	6	25.0	4	16.6	6	25.0	5	20.8	24	99.7

Table 6. (cont'd.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
24. Acquaint yourself with facilities for science in your community	3	12.5	6	25.0	8	33.3	4	16.6	3	12.5	24	99.9
25. Have talks, presentations, or demonstrations by outside speakers	4	17.4	3	13.0	8	34.8	3	13.0	5	21.7	23	99.9
26. Preparation and construction of individual projects	13	50.0	8	30.7	2	7.7	0	0	3	11.5	26	99.9
27. Exchange scientific items with clubs in other states and countries	3	13.6	1	4.5	6	27.3	4	18.2	3	36.4	22	100

Table 6. (concl.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
28. Keep occupational and educational information in science posted for members and others interested	4	16.6	3	12.5	7	29.2	5	20.8	5	20.8	24	99.9
29. Construction of new or needed laboratory equipment	6	26.1	7	30.4	1	4.3	2	8.7	7	30.4	23	99.9
30. Keep a science museum	1	4.8	4	19.0	7	33.3	2	9.5	7	33.3	21	99.9

\* A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.



Table 7. Summary of Questionnaire responses received from selected Kansas high school science clubs relative to opinions as to the effectiveness of certain science club activities in providing functional understanding of scientific principles.

Activities	Degree of Effectiveness *											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
17. Participate in science fairs	9	34.6	6	23.1	9	34.6	0	0	2	7.7	26	100
18. Conduct field trips	5	18.5	9	33.3	11	40.7	0	0	2	7.4	27	99.9
19. Study science biographies	4	15.3	1	3.8	10	38.5	3	11.5	8	30.8	26	99.9
20. Participate in the National Science Talent Search	5	20.0	8	32.0	6	24.0	2	8	4	16.0	25	100
21. Prepare and present assembly programs	3	12.0	11	44.0	4	16.0	1	4.0	6	24.0	25	100
22. Keep up with current science news	5	20.0	9	40.0	6	24.0	2	8.0	2	8.0	25	100
23. Participate in science achievement awards for students	6	26.1	6	26.1	3	13.0	3	13.0	5	21.7	23	99.9

Table 7. (cont'd.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
24. Acquaint yourself with facilities for science in your community	3	11.5	12	46.2	6	23.1	5	19.2	0	0	26	100
25. Have talks, presentations, or demonstrations by outside speakers	8	30.7	12	46.2	4	15.3	2	7.7	0	0	26	99.9
26. Preparation and construction of individual projects	13	47.7	9	33.3	2	7.4	0	0	3	11.1	27	99.6
27. Exchange scientific items with clubs in other states and countries	3	14.2	3	14.2	8	33.1	1	4.8	6	28.6	21	99.9
28. Keep occupational and educational information in science posted for members and others interested	4	16.0	3	12.0	8	32.0	3	12.0	7	28.0	25	100

Table 7. (concl.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent		Num- ber	Per- cent		Num- ber	Per- cent		Num- ber	Per- cent	Total
29. Construction of new or needed laboratory equipment	5	21.7	7	30.4	5	21.7	0	0	6	26.1	23	99.9
30. Keep a science museum	1	4.5	3	13.6	9	40.9	2	9.1	7	31.8	22	100

\* A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.



functional understanding of scientific principles. Data presented in Table 7 show that a variety of opinions existed in regard to the degree of effectiveness of certain science club activities in providing a functional understanding of scientific principles. However, it may be seen from Table 7 that it was the opinion of 13 or 47.7 percent of the cooperating schools that preparing and constructing individual projects was an extremely effective activity in providing a functional understanding of scientific principles. Additional frequencies concerning the activity of preparing and constructing individual projects, as reported by the cooperating schools were, "considerably effective," 9 or 33.3 percent, "averagely effective," 2 or 7.4 percent, and "no effectiveness," 3 or 11.1 percent. No schools reporting indicated this activity as being "slightly effective."

It may also be of interest to note from Table 7 that it was the opinion of only 1 or 4.5 percent of the 22 schools evaluating the effectiveness of keeping a science museum that this activity was extremely effective in providing a functional understanding of scientific principles.

#### Developing Scientific Attitudes

A summary of the cooperating science club sponsors' responses relative to opinions as to the effectiveness of certain activities in developing scientific attitudes is shown in Table 8. Data presented in Table 8 show that it was the opinion of 12 or 46.2 percent of the schools reporting that the preparation and construction of individual projects was extremely effective in developing scientific attitudes.

It may also be of interest to note from Table 8 that it was the opinion of only 2 or 8.7 percent of the cooperating schools that keeping a science

Table 8. Summary of Questionnaire responses received from selected Kansas high school science clubs relative to opinions as to the effectiveness of certain science club activities in developing scientific attitudes.

Activities	Degree of Effectiveness*											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Total
17. Participate in science fairs	6	26.1	6	26.1	8	34.8	2	7.3	1	7.3	23	100
18. Conduct field trips	7	25.9	11	40.7	7	25.9	2	7.4	0	0	27	99.9
19. Study science biographies	6	23.1	5	19.2	8	30.8	4	15.3	3	11.5	26	99.9
20. Participate in the National Science Talent Search	6	23.1	8	30.7	7	26.9	1	3.8	3	11.5	26	100
21. Prepare and present assembly programs	6	25.0	7	29.2	2	8.3	2	8.3	7	29.2	24	100
22. Keep up with current science news	6	25.0	8	33.3	7	29.2	1	4.2	2	8.3	24	100
23. Participate in science achievement awards for students	6	25.0	8	37.5	2	8.3	3	12.5	4	16.6	24	99.9

Table 8. (cont'd.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Total Num- ber
24. Acquaint yourself with facilities for science in your community	5	19.2	8	30.8	12	46.2	1	3.8	0	0	0	26
25. Have talks, presentations, or demonstrations by outside speakers	9	34.6	11	42.3	4	15.3	2	7.7	0	0	0	26
26. Preparation and construction of individual projects	12	46.2	8	30.8	3	11.5	0	0	3	11.5	26	100
27. Exchange scientific items with clubs in other states and countries	3	14.3	6	28.5	6	28.5	1	4.8	5	23.8	21	99.9



Table 8 (concl.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
28. Keep occupational and educational information in science posted for members and others interested	6	23.1	5	19.2	7	26.9	5	19.2	3	11.5	26	99.9
29. Construction of new or needed laboratory equipment	5	20.8	5	20.8	7	29.2	2	8.3	5	20.8	24	99.9
30. Keep a science museum	2	8.7	6	26.1	5	21.7	2	8.7	8	34.8	23	100

\* A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.

museum was extremely effective in developing scientific attitudes.

#### Developing Scientific Interests

Table 9 contains a summary of the cooperating science club sponsors' responses relative to opinions as to the effectiveness of certain activities in developing scientific interests. Data presented in Table 9 show that a variety of opinions existed in regard to the degree of effectiveness of certain science club activities in developing scientific interests. However, it may be seen from Table 9 that 15 or 53.6 percent of the cooperating schools indicated that the preparation and construction of individual projects was extremely effective in developing scientific interests. Additional frequencies concerning this activity were, "considerably effective," 10 or 35.7 percent, and "no effectiveness," 3 or 10.7 percent. No schools reported the activity as being "averagely effective," or "slightly effective" in developing scientific interests.

It may also be seen in Table 9 that only 4 or 16.6 percent of the schools responding to the activity of constructing new or needed laboratory equipment indicated that, in their opinion, this activity was extremely effective in developing scientific interests.

#### Developing Functional Concepts

Table 10 contains a summary of the cooperating science club sponsors' reactions relative to opinions as to the effectiveness of certain science club activities in developing functional concepts. Data presented in Table 10 reveal that it was the opinion of 10 or 38.5 percent of the cooperating schools that the preparation and construction of individual projects was extremely

Table 9. Summary of Questionnaire responses received from selected Kansas high school science clubs relative to opinions as to the effectiveness of certain science club activities in developing scientific interests.

Activities	Degree of Effectiveness *											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
17. Participate in science fairs	11	45.9	8	33.3	4	16.6	1	4.2	0	0	24	100
18. Conduct field trips	16	57.1	8	28.6	3	10.7	0	0	1	3.6	28	100
19. Study science biographies	7	25.0	10	46.4	4	14.3	1	3.6	3	10.7	28	100
20. Participate in the National Science Talent Search	9	36.0	8	32.0	4	16.0	1	4.0	3	12.0	25	100
21. Prepare and present assembly programs	6	25.0	9	37.5	3	12.5	1	4.2	5	20.8	24	100
22. Keep up with current science news	11	42.3	12	46.2	1	3.8	2	7.7	0	0	26	100
23. Participate in science achievement awards for students	7	28.0	10	40.0	2	8.0	3	12.0	3	12.0	25	100



Table 9. (cont'd.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Num- ber	Num- ber	Per- cent	Total Num- ber
24. Acquaint yourself with facilities for science in your community	12	44.4	13	48.1	2	7.4	0	0	0	0	0	27
25. Have talks, presentations, or demonstrations by outside speakers	13	46.4	14	50.0	0	0	1	3.6	0	0	0	28
26. Preparation and construction of individual projects	15	53.6	10	35.7	0	0	0	0	0	3	10.7	28
27. Exchange scientific items with clubs in other states and countries	5	22.7	8	36.4	3	13.6	1	4.5	5	22.7	22	99.9
28. Keep occupational and educational information in science posted for members and others interested	6	22.2	10	37.0	7	25.9	2	7.4	2	7.4	27	99.9

Table 9. (concl.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num-	Per-	Total	Num-	Per-	Total	Num-	Per-	Total	Num-	Per-	Total
	ber	cent		ber	cent		ber	cent		ber	cent	
29. Construction of new or needed laboratory equipment	4	16.6	9	37.5	6	25.0	0	0	0	5	20.8	24
												99.9
30. Keep a science museum	8	34.8	6	26.1	1	4.3	1	4.3	1	7	30.4	23
												99.9

\* A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.

effective in developing functional concepts. This percentage was the largest reported for any item in Table 10.

It may also be of interest to note from Table 10 that none of the schools reporting to the activity of keeping a science museum evaluated this activity as being extremely effective in developing functional concepts.

#### Providing Functional Information

A summary of the cooperating science club sponsors' responses relative to the effectiveness of certain science club activities in providing functional information is presented in Table 11. The data presented in Table 11 reveal that it was the opinion of 9 or 34.6 percent (the largest percentage reported) of the cooperating schools that conducting field trips was an extremely effective activity in providing functional information.

It may also be seen from Table 11 that almost an equal number of the cooperating schools, 8 or 30.7 percent, indicated that, in their opinion, the preparation and construction of individual projects was extremely effective in providing functional information.

Table 11 also shows that it was the opinion of only 2 or 8.7 percent of the cooperating schools that keeping a science museum was an extremely effective activity in providing functional information.

#### SELECTED PRACTICES RELATIVE TO THE ORGANIZATIONAL ASPECTS OF SCIENCE CLUBS

This section of the study presents the cooperating science club sponsors' responses to section III of the questionnaire. The section was designed to



Table 10. Summary of Questionnaire responses received from selected Kansas high school science clubs relative to opinions as to the effectiveness of certain science club activities in developing functional concepts.

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
17. Participate in science fairs	7	31.8	4	18.2	9	40.9	1	4.5	1	4.5	22	99.9
18. Conduct field trips	4	14.8	8	29.6	13	48.1	1	3.7	1	3.7	27	99.9
19. Study science biographies	3	12.5	0	0	11	45.4	6	25.0	4	16.6	24	99.5
20. Participate in the National Science Talent Search	4	16.0	7	28.0	5	20.0	3	12.0	6	24.0	25	100
21. Prepare and present assembly programs	2	8.0	6	24.0	10	40.0	1	4.0	6	24.0	25	100
22. Keep up with current science news	4	16.0	7	28.0	12	48.0	2	8.0	0	0	25	100
23. Participate in science achievement awards for students	2	8.7	7	30.4	4	17.4	5	21.7	5	21.7	23	99.9

Table 10. (cont'd.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
24. Acquaint yourself with facilities for science in your community	5	19.2	9	34.6	11	42.3	1	3.8	0	0	26	99.9
25. Have talks, presentations or demonstrations by outside speakers	5	20.8	11	45.8	6	25.0	2	8.3	0	0	24	99.9
26. Preparation and construction of individual projects	10	38.5	8	30.8	5	19.2	0	0	3	11.5	26	100
27. Exchange scientific items with clubs in other states and countries	3	13.6	4	18.2	8	36.4	1	4.5	6	27.3	22	100
28. Keep occupational and educational information in science posted for members and others interested	3	12.0	4	16.0	6	24.0	6	24.0	6	24.0	25	100

Table 10. (concl.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
29. Construction of new or needed laboratory equipment	2	9.1	10	45.4	4	18.2	0	0	6	27.2	22	99.9
30. Keep a science museum	0	0	5	23.8	6	28.5	4	19.0	6	28.5	21	99.8

\* A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.



Table 11. Summary of Questionnaire responses received from selected Kansas high school science clubs relative to opinions as to the effectiveness of certain science club activities in providing functional information.

Activities	Degree of Effectiveness*													
	A		B		C		D		E		Total			
	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent		
17. Participate in science fairs	5	17.8	9	32.1	12	42.9	0	0	2	7.1	28	99.9		
18. Conduct field trips	9	34.6	9	34.6	6	23.1	1	3.8	1	3.8	26	99.9		
19. Study science biographies	3	12.0	3	12.0	10	40.0	3	12.0	6	24.0	25	100		
20. Participate in the National Science Talent Search	6	25.0	6	25.0	5	20.8	2	8.3	5	20.8	24	99.9		
21. Prepare and present assembly programs	3	12.5	7	19.2	6	25.0	3	12.5	5	20.8	24	100		
22. Keep up with current science news	5	20.0	16	64.0	3	12.0	1	4.0	0	0	25	100		
23. Participate in science achievement awards for students	5	19.2	6	23.1	6	23.1	4	15.3	5	19.2	26	99.9		

Table 11. (cont'd.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
24. Acquaint yourself with facilities for science in your community	3	12.0	11	44.0	11	44.0	0	0	0	0	25	100
25. Have talks, presentations, or demonstrations by outside speakers	6	24.0	11	48.0	5	20.0	2	8.0	0	0	25	100
26. Preparation and construction of individual projects	8	30.7	13	50.0	2	7.7	0	0	3	11.5	26	99.9
27. Exchange scientific items with clubs in other states and countries	3	13.6	6	27.3	7	31.8	1	4.5	5	22.7	22	99.9
28. Keep occupational and educational information in science posted for members and others interested	3	13.0	5	21.7	8	34.8	4	17.4	3	13.0	23	99.9

Table 11. (concl.)

Activities	Degree of Effectiveness											
	A			B			C			D		
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
29. Construction of new or needed laboratory equipment	4	17.4	10	43.5	2	8.7	0	0	7	30.4	23	100
30. Keep a science museum	2	8.7	3	13.0	8	34.8	4	17.4	6	26.1	23	100

\* A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.



ascertain practices relative to the organizational aspects of science clubs in the cooperating school systems.

#### The Size of Science Clubs

Table 12 contains a summary of the cooperating science club sponsors' reactions relative to the number of members in their science clubs. Data presented in Table 12 show that the mean average membership for science clubs in the cooperating schools was 26.9 students. The most frequently reported science club membership of the cooperating schools was 30, while the median or midpoint was 25 students. The largest science club membership indicated by any cooperating school was 80, the number being reported by the Manhattan High School Science Club. The smallest membership reported by any cooperating school was 4, the number being reported by the Wichita South High School.

#### The Types of Science Clubs

Table 13 summarizes the responses of the cooperating science club sponsors as regards the type of science to which their science clubs are devoted. The data contained in Table 13 show that it was the practice of 32 or 88.8 percent of the cooperating schools to devote their science clubs to all sciences. Additional types of science clubs, as reported by the remaining cooperating schools were, Biology, 1 or 2.8 percent; Ecology, 1 or 2.8 percent; Medical careers, 1 or 2.8 percent; and a combination of Chemistry, Biology, and Physics, 1 or 2.8 percent.

Table 12. Summary of Questionnaire responses received from 36 selected Kansas high school science club sponsors relative to the size of their science clubs.

Range	:	Mean	:	Median	:	Mode
4 - 80	:	26.9	:	25	:	30

Table 13. Summary of Questionnaire responses received from 36 selected Kansas high school science clubs relative to the type of science club.

Type of Science Club	:	Number	:	Percent
All sciences	:	32	:	88.8
Biology	:	1	:	2.8
Ecology	:	1	:	2.8
Medical careers	:	1	:	2.8
Chemistry, Biology, and Physics	:	1	:	2.8

#### Time Devoted to Outside School Hours for Science Club Activities

A summary of the cooperating science club sponsors' reactions pertinent to the time devoted to outside school hours for science club activities is shown in Table 14. Data presented in Table 14 show that the mean average number of hours per month devoted to outside school hours for science club activities by the cooperating schools was 4.1 hours. The median number of hours reported for this practice was 3 while a mode of 0 was reported.

Table 14. Summary of Questionnaire responses received from 36 selected Kansas high school science clubs relative to the time in hours per month devoted to outside school hours for science club activities.

Range	:	Mean	:	Median	:	Mode
0 - 24	:	4.1	:	3	:	0
-	:		:		:	

#### Hours Earned in Science by Science Club Sponsors

Table 15 contains a summary of the responses of the cooperating science club sponsors with respect to the semester hours that such sponsors have earned in science. Data presented in Table 15 reveal that a variety of responses existed in regard to the number of hours earned in various science courses by the science club sponsors. However, it may be seen from Table 15 that the mean average number of semester hours earned in chemistry by 32 or 83.9 percent of the cooperating science club sponsors was 21.6 hours.

It may also be of interest to note from Table 15 that the mean number of hours earned in Botany by 27 or 75.0 percent of the cooperating science club sponsors was only 10.8 semester hours which appears quite inadequate for the pursuit of Botany projects or the teaching of Botany in secondary school science clubs.

Of further interest, it may be seen in Table 15 that only two of the cooperating science club sponsors indicated that they had earned semester hours of credit in Astronomy or Physical Science. In this regard the number of semester hours earned was six and ten respectively. When viewed in the light of recent developments in science, the failure of science club sponsors



to have formal training in Astronomy and Physical Science would seem to be a serious omission. Especially is this true when it is considered that the aforementioned science areas easily lend themselves to club projects and activities that are of interest to many secondary school students today.

Table 15. Summary of Questionnaire responses received from 36 selected Kansas high school science clubs relative to the semester hours in science earned by science club sponsors.

Science Subject	Range	Mean	Median	Mode	Number	Percent
Botany	0-50	10.8	8	20	27	75.0
Chemistry	0-55	21.6	19	10	32	88.9
Geology	0-10	2.7	3	3	20	55.5
Physics	0-53	15.9	12.5	10	30	83.3
Zoology	0-75	17.4	9	8	25	69.5
Biology	4-66	33	38.5	70	6	16.6
Mathematics	20-53	36.6	37		3	8.3
Bacteriology	5-10	7.5	5.5		2	5.6
Astronomy	6				1	2.8
Physical Science	10				1	2.8

#### SUMMARY AND CONCLUSIONS

The following section of the study consists of a summary of the science club programs in 36 selected Kansas high schools as reported by science club sponsors cooperating in the survey. The data indicated that the science club activities most frequently employed in the 36 Kansas schools participating in the study were, keeping up with current science news, getting acquainted with

the facilities for science in the community, preparing and constructing individual projects, having talks, presentations, or demonstrations by outside speakers, and keeping occupational and educational information in science posted for members and others interested. The data also revealed that each of these activities were regularly or often employed by at least 50 percent of the cooperating schools.

The study also revealed that the activities least used in the science clubs of the schools participating in the study were, exchanging scientific items with clubs in other states and countries, participating in science congresses, keeping a science museum, preparing and presenting assembly programs, studying science biographies, constructing new or needed laboratory equipment, and participating in the National Science Talent Search.

Regarding opinions as to the effectiveness of the above mentioned activities in meeting the objectives of science instruction in secondary schools, it was evident that the science club sponsors considered preparing and constructing individual projects as the most effective activity in meeting the objectives of science instruction.

The practices selected in the study relative to organizational aspects of science clubs appear to be weak in some respects, especially the part concerning the course hours earned in science by the science club sponsors. For example, the study revealed that only two of the cooperating science club sponsors had earned any semester hours of credit in Astronomy or Physical Science. In this regard the number of semester hours earned were six and ten respectively. In addition, the mean number of semester hours earned in Botany and Geology was 10.8 and 2.7 hours respectively, which seems quite

inadequate for the pursuit of science club projects in these areas.

The mean average membership for science clubs in the cooperating schools was 26.9 students. The most frequently reported science club membership was 30, while the median was 25 students.

The study also revealed that it was the practice of 88.8 percent of the cooperating schools to devote their science clubs to all sciences. Additional types of science clubs were Biology, Ecology, Medical careers, and a combination of Chemistry, Biology, and Physics.

The mean average number of hours per month devoted to outside school hours for science club activities by the cooperating schools was 4.1 hours. The median number reported for this practice was 3 while a mode of 0 hours was reported.

In conclusion, it is the opinion of the writer that the Kansas high school science clubs with enrollments of 400 or more have reasonably active science programs. However, it is evident that some activities presently not being employed regularly in these clubs might well be given considerable attention. For example, participation in the National Science Talent Search, and preparing and presenting assembly programs are activities that should be regularly employed. Another area needing considerable attention is that of practices relative to the organizational aspects of science clubs. It may be concluded that such aspects could be strengthened by an increase in the number of hours in science earned by the science club sponsors.



#### ACKNOWLEDGMENT

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## APPENDIXES

## APPENDIX A

Questionnaire sent to 61 selected  
Kansas high school science club sponsors

535 N. Manhattan  
Manhattan, Kansas  
April 6, 1962

Dear Sir:

Science club activities are an important aspect of the total science program of the secondary school. Hence I have chosen this study as the subject of my Master's report.

Since little material is available on the activities of Kansas high school science clubs, the subject is both timely and significant.

I will appreciate your cooperation in supplying information about your science club activities on the enclosed questionnaire.

Sincerely,

William H. Gibson



The purpose of this questionnaire is to obtain data concerning activities of science clubs in Kansas high schools.

In the columns following each activity place a check ( ) for the response that best describes the frequency of use by your science club.

### I. Frequency of Certain Science Club Activities

	Regularly	Often	At times	Seldom	Never
1. Participate in science fairs .....					
2. Conduct field trips .....					
3. Study science biographies .....					
4. Participate in the National Science Talent Search .....					
5. Prepare and present assembly programs .....					
6. Keep up with current science news ...					
7. Participate in science achieve- ment awards for students .....					
8. Acquaint yourself with facilities for science in your community .....					
9. Have talks, presentations, or demonstrations by outside speakers .....					
10. Preparation and construction of individual projects .....					
11. Exchange scientific items with clubs in other states and countries .....					
12. Keeping occupational and educa- tional information in science posted for members of your club and others interested .....					
13. Construction of new or needed laboratory equipment .....					
14. Participation in science con- gresses .....					
15. Keeping a science museum .....					
16. List other activities that your club uses .....					

II. Opinion as to the Effectiveness of Certain Science Club Activities (please employ the following rating scale to indicate the degree of response which, in your judgment, best describes the effectiveness of the following activities).

A - Extremely effective; B - Considerably effective; C - Averagely effective; D - Slightly effective; E - No effectiveness.

	Providing functional information	Developing functional concepts	Developing scientific interest	Developing scientific attitudes	Providing functional understanding of scientific principles	Developing problem solving skills	Developing instrumental skills	Developing scientific appreciation
17. Participate in science fairs ...								
18. Conduct field trips .....								
19. Study science biographies .....								
20. Participate in the National Science Talent Search .....								
21. Prepare and present assembly programs .....								
22. Keep up with current science news .....								
23. Participate in science achievement awards for students .....								
24. Acquaint yourself with facilities for science in your community .....								
25. Have talks, presentations, or demonstrations by outside speakers .....								
26. Preparation and construction of individual projects .....								
27. Exchange scientific items with clubs in other states and countries .....								
28. Keep occupational and educational information in science posted for members of your club and others interested .....								
29. Construction of new or needed laboratory equipment .....								
30. Keep a science museum .....								
31. List other activities that your club uses								

### III. Selected Practices Relative to the Organizational Aspects of Science Clubs

32. Indicate the number of members in your science club. \_\_\_\_\_

33. Indicate by (✓) whether your science club is devoted to:

\_\_\_\_\_ All sciences      \_\_\_\_\_ Chemistry      \_\_\_\_\_ Biology

\_\_\_\_\_ Physics      \_\_\_\_\_ Astronomy      \_\_\_\_\_ Geology

\_\_\_\_\_ Radio      \_\_\_\_\_ Photography

List others \_\_\_\_\_

34. Approximately how much time is devoted to outside school hours for science club activities? \_\_\_\_\_

35. Please indicate the hours (semester or quarter) of preparation that you have had in the following:

\_\_\_\_\_ Botany      \_\_\_\_\_ Zoology      \_\_\_\_\_ Chemistry

\_\_\_\_\_ Physics      \_\_\_\_\_ Geology      Other \_\_\_\_\_

Indicate by (✓) if you wish a summary of the results of this study sent to you. \_\_\_\_\_



## APPENDIX B

Distribution of questionnaires to 61 selected  
Kansas high school science club sponsors

## Distribution of questionnaires to 61 selected Kansas high school science clubs.

Name of school	: Enrollment	: Response	: No response
ABILENE			
Abilene High School	523		x
ALTAMONT			
Labette County Community High School	791	x	
ARKANSAS CITY			
Arkansas City High School	699		x
ATCHISON			
Atchison High School	982	x	
AUGUSTA			
Augusta High School	401	x	
BAXTER SPRINGS			
Baxter Springs High School	505	x	
BETHEL			
Washington High School	1206	x	
BONNER SPRINGS			
Bonner Springs High School	497	x	
BUHLER			
Buhler High School	422	x	
CHANUTE			
Chanute High School	554		x
CHAPMAN			
Dickinson County Community High School	434		x
CLAY CENTER			
Clay Center High School	486	x	
COFFEYVILLE			
Coffeyville High School	881	x	
COLUMBUS			
Columbus High School	557	x	
CONCORDIA			
Condordia High School	629		x

Name of school	: Enrollment	: Response	: No response
DERBY			
Derby High School	690	x	
DODGE CITY			
Dodge City High School	618	x	
EL DORADO			
El Dorado High School	595	x	
EMPORIA			
Emporia High School	654	x	
FORT SCOTT			
Fort Scott High School	442	x	
GARDEN CITY			
Garden City High School	571		x
GREAT BEND			
Great Bend High School	736	x	
HAYS			
Hays High School	703	x	
HUGOTON			
Hugoton High School	462	x	
HUTCHINSON			
Hutchinson High School	1292	x	
JUNCTION CITY			
Junction City High School	637	x	
KANSAS CITY			
Argentine High School	1177	x	
Rosedale High School	1090	x	
Sumner High School	770		x
Wyandotte High School	1961	x	
KINGMAN			
Kingman High School	426	x	
LAWRENCE			
Lawrence High School	1100	x	
LEAVENWORTH			
Leavenworth High School	947		x



Name of school	: Enrollment	: Response	: No response
LIBERAL			
Liberal High School	876	x	
McPHERSON			
McPherson High School	685	x	
MANHATTAN			
Manhattan High School	762	x	
MARYSVILLE			
Marysville High School	431	x	
NEODESHA			
Neodesha High School	504	x	
NEWTON			
Newton High School	672	x	
OTTAWA			
Ottawa High School	990		x
PAOLA			
Paola High School	532	x	
PARSONS			
Parsons High School	436		x
PITTSBURG			
Pittsburg High School	524		x
RUSSELL			
Russell High School	503		x
SALINA			
Salina High School	1463	x	
SHAWNEE MISSION			
East High School	2433	x	
North High School	2323		x
TOPEKA			
Central High School	1807		x
Highland Park High School	791	x	
Seaman High School	567	x	
Washburn High School	631	x	

Name of school	: Enrollment	: Response	: No response
TURNER			
Turner High School	1131		x
WELLINGTON			
Wellington High School	447	x	
WICHITA			
East High School	2769	x	
North High School	1795		x
South High School	1538	x	
SouthEast High School	1840	x	
West High School	1519	x	
Campus Rural High School	1067	x	
Wichita Heights Rural High School	704		x
WINFIELD			
Winfield High School	1180	x	

A STUDY OF SELECTED KANSAS HIGH SCHOOL SCIENCE CLUBS

by

WILLIAM HOWARD GIBSON JR.

B. S., Lincoln University, 1961

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AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Education

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1963



Over the years, increased attention has been given to the importance and improvement of science clubs in the educational program. One of the primary causes for the growth and development of this co-curricular science activity was the urgent need to develop the scientific ability that exists throughout the country. Today, it is an accepted fact that the many pursuits provided by science clubs can serve as an important motivating influence in spurring students to enter the various fields of science.

The purpose of this study was to ascertain certain practices of selected Kansas public high school science clubs. The report considers the criteria of the objectives of science instruction in secondary schools as suggested in professional literature.

The procedure employed in conducting this study consisted of a review of the pertinent literature relative to high school science clubs and additional material prepared by Science Clubs of America. In addition, a questionnaire relative to the frequency of use of certain activities, opinions as to the effectiveness of these activities, and selected practices related to the organizational aspects of science clubs was sent to 61 selected Kansas high schools on the basis of enrollment as listed for the school year 1961-1962. Kansas public high schools with enrollments of 400 or more were included in the study.

Results of the study indicated that the most frequently employed science club activities were, keeping up with current science news, getting acquainted with facilities for science in the community, and preparing and constructing individual projects, while the least used activity was exchanging scientific items with clubs in other states and countries. The most effective activity

in meeting the objectives of science instruction in secondary schools was the preparation and construction of individual projects.

The study revealed that the mean average membership of science clubs in the cooperating schools was 26.9 students, ranging from 4 to 80. It was the practice of 88.8 percent of the schools to devote their science clubs to all sciences.

The study also revealed that the mean average number of hours per month devoted to outside school hours for science club activities was 4.1 hours.

A decisive weakness was noted in regard to the hours earned by the science club sponsors in the areas of physical science and astronomy. It is the opinion of this writer that additional hours in these areas should be earned in order that science club sponsors may perform a more effective job as leaders of science clubs.